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(57) A buckle for safety belts comprises a hollow support (10) of rectangular section, an ejector member (13) for the tongue which is slidable in the said support, a sleeve (22) for closing and opening the buckle which is slidable on the said support, and tongue locking means (16) operated by the said sleeve. It

further comprises locking means (19) adapted to cooperate selectively with corresponding locking notches provided in the said ejector member or with corresponding recesses provided in the said sleeve for the purpose of locking the ejector member in the position corresponding to maximum insertion of the tongue (Fig. 4), or respectively locking the sleeve in the open position (Fig. 6) of the buckle.

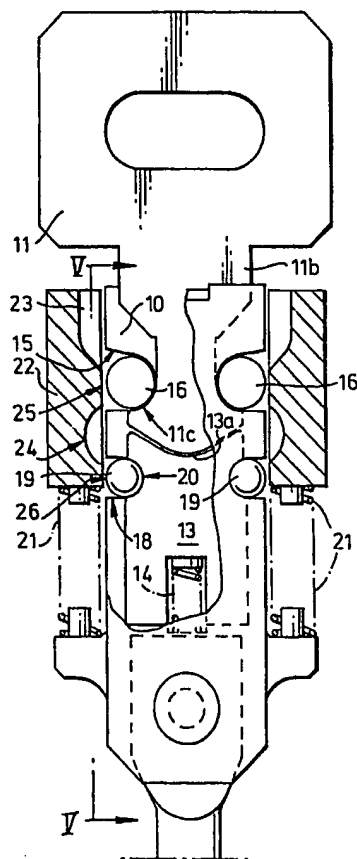


Fig.4.

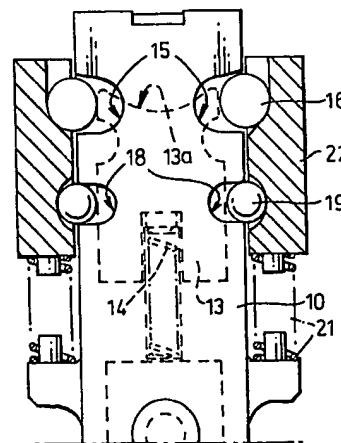


Fig. 6.

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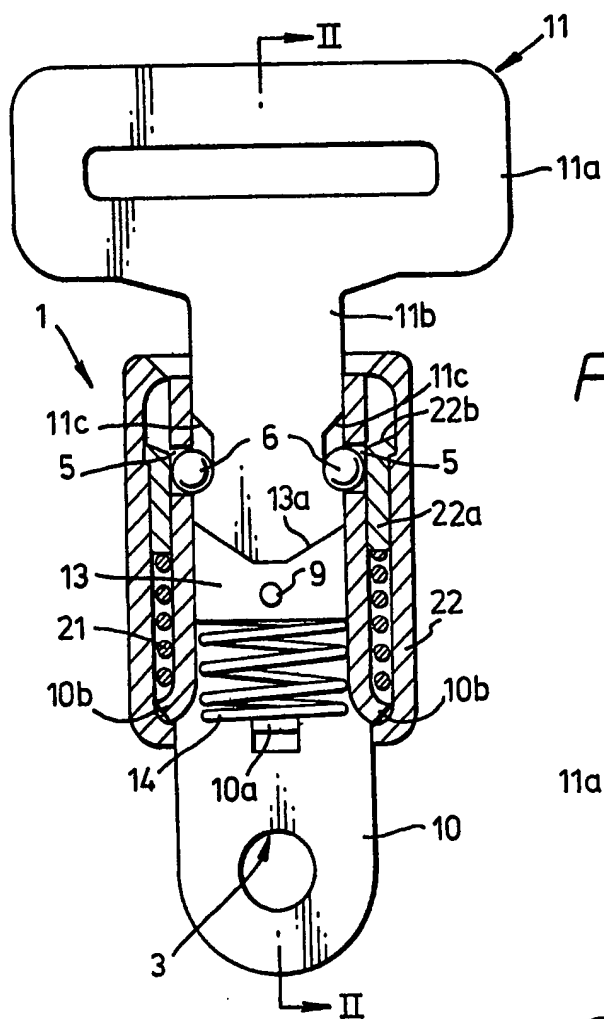
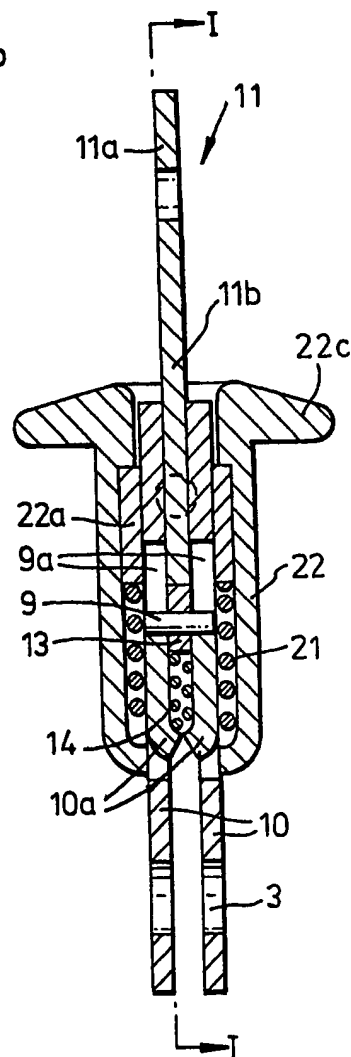
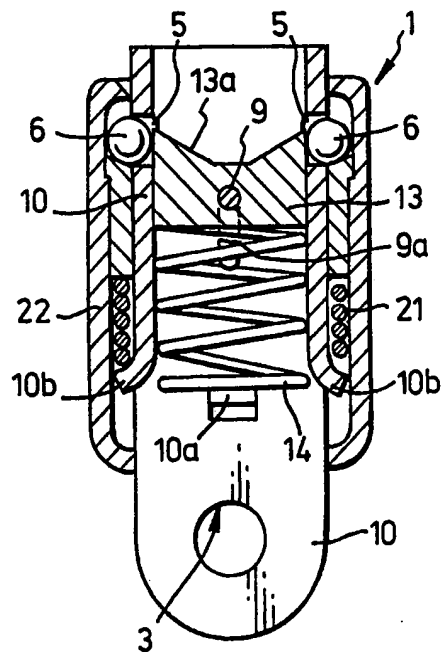
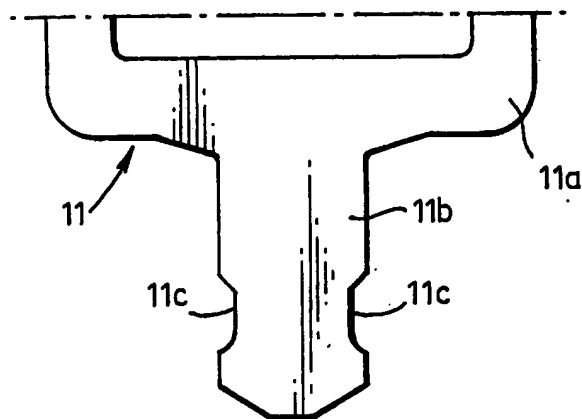


Fig. 1.

Fig. 2.





*Fig. 3.*

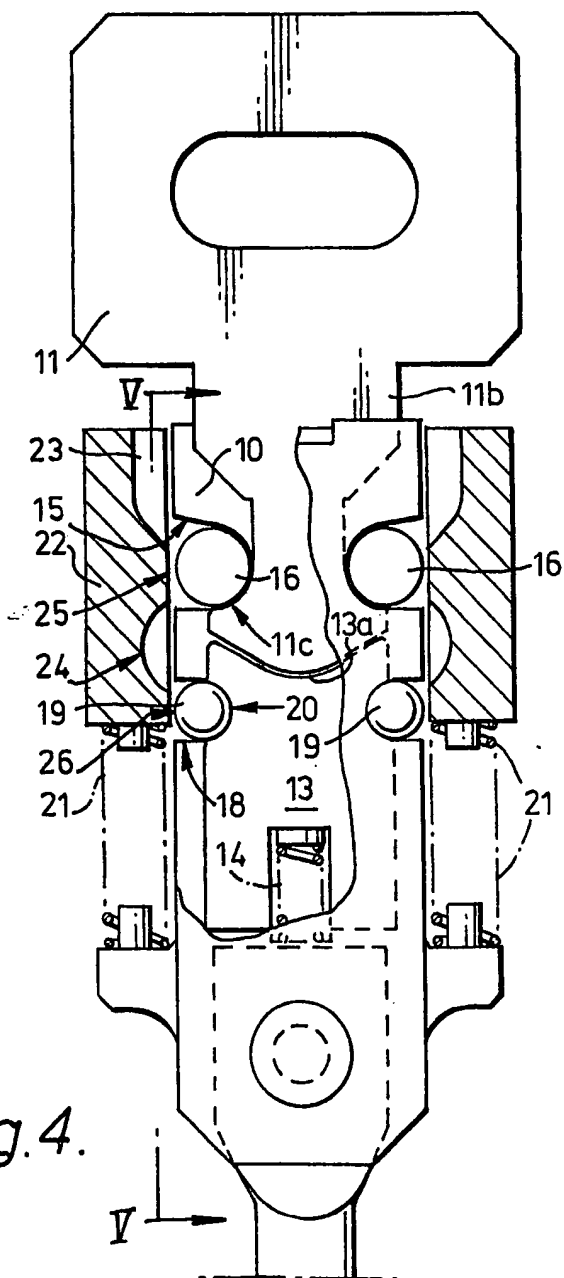


Fig.4.

Fig. 5.

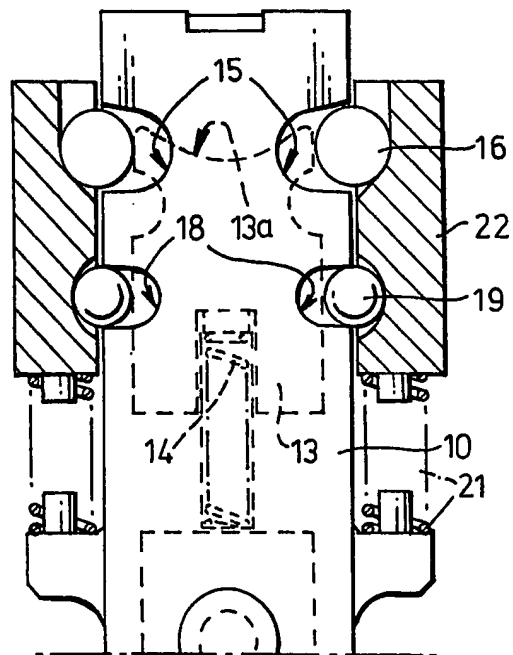
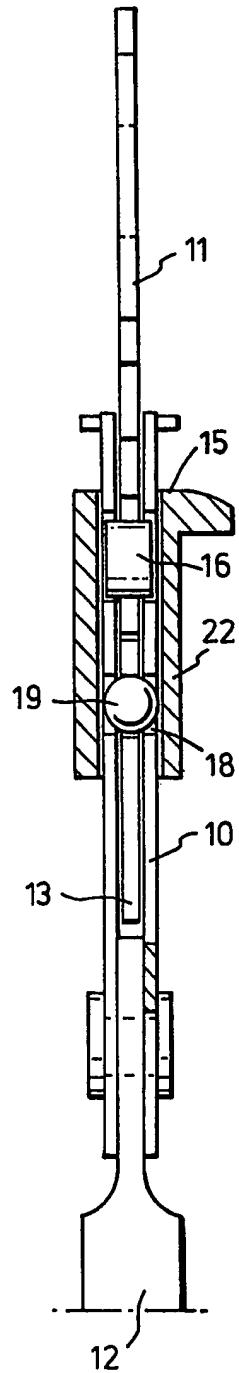


Fig. 6.

## SPECIFICATION

## Buckle for safety belts

The present invention relates to a buckle for safety belts, particularly for motor vehicles, of the type comprising a tubular support of rectangular section which is adapted to receive slidably a flat tongue carried at the end of the belt and provided with locking notches, locking means carried by the said tubular support and adapted to engage the notches in the tail of the tongue when the said tail is inserted into the tubular support, buckle opening means adapted to be operated manually in order to disengage the said locking means from the notches in the tongue, and a resilient ejector member for expelling the said tongue from the said tubular support when the opening means are operated.

The essential aim of the invention is that of providing a buckle of the type specified which is of particularly simplified construction, safe and reliable in operation, and free from obstructions.

One particular advantageous embodiment of the invention is in addition directed towards avoiding faulty fastening, by ensuring a firm connection between the buckle and the tongue of the safety belt even if the operation of inserting the tongue is effected in an uncertain manner.

Another important aim of the invention is that of providing a buckle equipped with positively acting tongue locking means; by "positively acting" is meant the action applied by direct contact between the locking members and the means for operating them, without the interposition of resilient means which limit the tensile strength of the coupling between the tongue and the buckle.

Yet another important aim of the invention is that of providing a buckle having a strong construction and connected directly to the body of the motor vehicle, together with tongue locking means carried by the said construction, which means, when in the operative position retaining the tongue, stabilise a direct, mechanically continuous connection between the said tongue and the said strong construction, which takes the tractive forces acting on the belt.

In accordance with the invention, whose aim is to avoid all possibility of incorrect fastening, resulting from an uncertain operation of insertion of the tongue, the ejector member is in turn subjected to the retaining action of the locking members which retain it in the position corresponding to complete engagement on the tongue and, only in this position of the said ejector member, permit the tripping displacement of the sleeve which brings about the displacement of the locking members in the locking notches of the tongue.

In an embodiment of the invention the outer sleeve is provided with two pairs of notches corresponding to the locking members of the tongue and of the ejector member respectively, and its operation in the opening direction, freeing both these locking members, enables the ejector

member to act as expulsion means for the tongue.

Further characteristics of the present invention will be seen from the following description given with reference to the accompanying drawings, which are supplied solely by way of example without limitation, and in which:—

Figure 1 is a view in section on the line I—I in Figure 2 of a safety belt buckle constituting a construction of the invention disclosed in our British Patent Application No. 7913213, the buckle being shown in its locked position; Figure 2 is a section on the line II—II in Figure 1;

Figure 3 is a similar section to Figure 1, but shows the buckle in its unlocked position,

Figure 4 is a partly sectional view of the buckle according to an improved embodiment of the invention, showing the same in the locked position (for the sake of greater clarity the buckle is shown without its outer shell which contains and conceals the mechanisms);

Figure 5 is a section on the line II—II in Figure 4; and

Figure 6 is a similar view to Figure 1, but shows the buckle in the unlocked position.

Referring to Figures 1 to 3, which show a construction in accordance with the invention disclosed in our British Patent Application No. 7913213 (2,050,485A), 1 indicates generally a buckle for safety belts which comprises a tubular support 10 of rectangular section provided at one end with a hole 3 for fastening with the aid of a connecting arm (not shown) of known type to the supporting structure of a motor vehicle. 11 indicates a tongue having a head 11a provided with a rectangular eye suitable for permitting the fastening of the safety belt (not shown), and a shank 11b intended to be inserted into the interior of the tubular support 10. The smaller faces of the tubular support 10 have two oppositely situated holes 5 receiving two balls 6 intended for tripping engagement in two corresponding locking notches 11c provided in the shank 11b of the tongue 11 in order to permit the locking of said tongue inside the tubular support 10. Inside the tubular support 10 is mounted for sliding an ejector member 13 having an end surface 13a on which is engaged the free end of the shank 11b when the tongue 11 is inserted into the interior of the tubular support 10. On the smaller faces of the tubular support 10 are formed two tongues 10a folded over towards the interior of the support 10 so as to form a support for a spring 14 inserted inside the tubular support 10 and acting on the end surface of the ejector member 13 lying opposite the surface 13a. The spring 14 tends to hold the ejector member 13 in such a position in relation to the tubular support 10 that its smaller side faces obstruct the two holes 5 in the tubular support 10. Fastened to the ejector member 13 is a transverse pin 9 whose ends are slidable in two guide grooves 9a formed longitudinally in the larger faces of the tubular support 10.

On the outside of the tubular support 10 is mounted for sliding a sleeve 22 of rectangular

section, in the interior of which is fixed a tubular member 22a, likewise of rectangular section, which has an end surface 22b in the form of a rectangular frame; the smaller sides of this frame are inclined towards the interior of the tubular member 22a, as shown in Figure 1. On the other end surface of the tubular member 22a, which is opposite the surface 22b, acts the end of a spring 21 housed in the gap between the tubular support 10 and the sleeve 22, the opposite end of the said spring being supported on two turned-back tongues 10b formed in the smaller faces of the tubular support 10. The spring 21 tends to hold the tubular member 22 in a position such that its inner surface obstructs the two holes 5 of the tubular support 10. On its larger faces, adjacent its end which is turned towards the end of the tubular support 10, the sleeve 22 has two transverse fins 22c adapted to form a support for facilitating the manual operation of unlocking the safety belt according to the invention.

When the safety belt is in the locked position shown in Figure 1, the spring 14 is compressed and tends to push the ejector member 13 in the upward direction and consequently to push the shank 11b of the tongue 11 in the same direction. Since however the tubular member 22a obstructs the holes 5 in the tubular support 10, the balls 6, being pressed against the locking notches 11c of the tongue shank 11, prevent the displacement of the tongue and of the ejector member 13.

In order to unlock the safety belt it is necessary to apply pressure manually to the fins 22c of the sleeve 22 so as to bring about an axial displacement of the said sleeve in relation to the tubular support 10. Since the sleeve 22 is then in a position in which, the reaction of the spring 21 being overcome, the tubular member 22a no longer obstructs the two holes 5 of the tubular support 10, the balls 6 can be displaced radially outwards through the action applied to them by the cam profiles of the notches 11c as the result of the expansion of the spring 14. The ejector member 13 can therefore be displaced axially in the direction of the balls 6, assuming the position shown in Figure 3 and bringing about the expulsion of the shank 11b of the tongue 11 from the interior of the tubular support 10. The guide grooves 9a cooperating with the pin 9 fastened to the ejector member 13 have the purpose of preventing accidental expulsion of the ejector member 13 from the tubular support 10.

When the safety belt is in the unlocked position shown in Figure 3, in order to bring about the locking of the tongue 11 inside the tubular support 10 it is simply necessary to insert the shank 11b into the tubular support 10 and to apply manual pressure to the tongue 11 so as to bring about a displacement of the ejector member 13 and the compression of the spring 14. When the coupling notches 11c of the shank 11b reach positions corresponding to the two oppositely situated holes 5 in the tubular support 10, the action of the inclined surfaces 22b on the balls 6 as a result of the expansion of the spring 21 effects the tripping

engagement of the said balls 6 in the notches 11c in the position shown in Figure 1.

In the construction, which is in accordance with the present invention, shown in Figures 4 to 6 (in which like or corresponding parts to those previously described are given the same reference numerals), the support 10 likewise contains the slidable antagonistic member 13 urged by a spring 14 in the direction of expulsion of the tongue 11. The support 10 has a first pair of seats 15 for receiving locking members 16 adapted to cooperate with the corresponding surfaces 11c of the tongue for the purpose of retaining the latter. The locking members 16 are composed of small cylinders disposed with their axes perpendicular to the plane of the support 10 and adapted to be displaced transversely in relation to the longitudinal axis of the buckle, so as to pass from a position of engagement of the tongue, in which position the cylinders are displaced towards the central axis of the support 10 (Figure 4), to a position of disengagement in which the cylinders are displaced towards the outside (Figure 6). A second pair of seats 18 is in addition provided on the support 10, in a position below the seats 15 previously described. In the seats 18 are accommodated corresponding locking members 19, which are likewise adapted to be displaced transversely for the purpose of engaging and disengaging corresponding locking notches 20 provided on the ejector member 13. The locking members 19 are preferably in the form of balls. The locking notches 20 are provided at the end 13a of the ejector member 13 which is intended to come into contact with the tongue 11, and the seats 18 are disposed in such a manner that the balls 19 engage the said notches when the ejector member is situated in the completely lowered position — against the action of the spring 14 — corresponding to complete engagement of the tongue 11. The sleeve 22 is mounted for axial sliding on the support 10 against the action of the springs 21. In the sleeve are provided a first pair of recesses 23 shaped substantially as inclined planes and intended to cooperate with the cylinders 16, as previously described, and a second pair of recesses 24 intended to cooperate similarly and correspondingly with the balls 19. Between the first and second pairs of recesses is provided a rectilinear portion 25 spaced apart from the support 10 with minimum clearance. A similar rectilinear portion 26 is also provided as continuation of the recesses 24, so that the latter are positioned between the rectilinear portions 25 and 26. The reciprocal arrangement of the recesses and of the aforesaid rectilinear portions is such that when the sleeve 22 is in the closed position shown in Figure 4, corresponding to the extended position of the springs 21, the rectilinear portions 25 and 26 are in alignment with the cylinders 16 and with the balls 19 respectively, so that the said cylinders and balls are prevented from being displaced transversely into the position of disengagement of the tongue and of the ejector member respectively. Conversely, when the sleeve

is displaced into the opening position corresponding to the compressed position of the springs 21, the recesses 23 and 24 respectively are situated in alignment with the cylinder 16 and balls 19, so that they are able to make the transverse disengaging displacement towards the outside of the support 10. This disengagement is effected with a tripping action through the effect of the spring 14. The latter, acting on the ejector member 13, applies to the latter an axial force to which corresponds (as the result of the profile of the locking surfaces 17 of the tongue 11 and of the notches 20 of the member 13) a transverse force tending to bring about the aforesaid transverse displacement of the locking members. On the other hand, as soon as this displacement takes place the ejector member 13, being freed, acts axially on the tongue 11, which has likewise been freed, so as to bring about the expulsion. As clearly shown in Figure 6, the axial displacement of the ejector member resulting from the expulsion brings the rectilinear portion of the said member into contact with the balls, which, being held in the extracted position, are firmly held in engagement with the recesses 24 of the sleeve so as to retain the latter correspondingly in a secure open position. it will readily be understood that when the tongue is then completely inserted, pushing the ejector member as far as it will go, will bring notches 20 into a position corresponding to the balls 19 which, because in turn of the action of the springs 21, will be pushed transversely into engagement with the said notches so as to lock the ejector member and at the same time to free the sleeve 22. The latter, under the thrust of the springs 21, will slide axially on the support 10 and assume the position shown in Figure 4, i.e. the closed position. When this displacement takes place the inclined planes of the recesses 23 will displace the

40 cylinders 16 into the seats 15 of the support in order to bring about the locking engagement of the said cylinders with the locking surfaces 11c of the tongue.

#### CLAIMS

45 1. A buckle for safety belts comprising a hollow support of rectangular section, a ejector member for the tongue which is slidable in the said support, a sleeve for closing and opening the buckle which is slidable on the said support, and tongue locking means operated by the said sleeve, 50 characterised in that it comprises further locking means adapted to cooperate selectively with corresponding locking notches provided in the said ejector member or with corresponding 55 recesses provided in the said sleeve for the purpose of locking the ejector member in the position corresponding to maximum insertion of the tongue, or respectively locking the sleeve in the open position of the buckle.

60 2. A buckle according to Claim 1, characterised in that the said recesses provided in the sleeve are situated between rectilinear portions of the latter which are adapted to act in direct contact engagement on the locking members in order to bring about the engaging displacement of the tongue and respectively of the ejector member. 65

3. A buckle according to Claims 1 and 2, in which the locking members of the tongue are composed of small cylinders and the additional 70 locking members for selective locking of the sleeve or of the ejector member are composed of small balls.

4. A buckle for safety belts, the buckle being substantially as hereinbefore described with 75 reference to, and as illustrated in, Figures 4 to 6 of the accompanying drawings.